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02 A NEW APPROACH TO AN OLD PROBLEM

MAR 12 1965

C & R-PREP

Dec 5/64
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of the Entomological Society of America, Philadelphia,
Pennsylvania, December 1964.

A new approach to an old problem--the old problem is the boll weevil, and the new approach is a new control technique that is being used to prevent further spread of this destructive cotton insect.

The boll weevil has been the classic among the economic insects of this country that have taxed the ingenuity of our scientists to find a way to stop its depredation. It is an "old timer" that predates most of us, having been here since 1892 when it was first found near Brownsville, Texas. History reveals that during the following 30 years it spread throughout 85 percent of the cotton-producing areas of the South and, during that time, it laid waste many cotton fields, caused hardship and privation and, in fact, changed the agricultural economy of many communities.

Despite all of man's efforts to control it, the boll weevil continues to be one of the most destructive pests. The National Cotton Council estimated that losses from the weevil during the period 1928 through 1954 were in excess of \$200,000,000 annually, about four-fifths of the loss caused by all cotton insects. In the 70 odd years that it has been here the cotton grower has learned to live with it through cultural practices and chemicals and with the help of parasites and predators.

With as many as seven generations in some areas, control is almost a continuous process throughout the growing season. Millions of pounds of insecticides are used during the season and sometimes 10 to 15 applications are required. Cost of control in the extreme ranged to \$25.00 an acre. What a price to pay to live with a pest, and what a price to pay and still have to endure tremendous crop losses.

This is a formidable pest apparently not content with the vast acreage of the southeast that it has conquered as a simple species. It is now extending its conquest to new areas where scientists formerly believed it could not survive. We obviously are now dealing with a species complex.

For many years the boll weevil seemed at home only under the high humidity conditions of the southeast, and it was the general consensus that it could never become a problem in the dry, arid region of the

southwest. The first indication that this concept was no longer sound was the discovery of established infestations of the weevil at Redford about 20 miles southeast of Presidio, Texas, in 1953. That year the weevil could be found in abundance in this area and the growers were experiencing economic losses. Insecticides were applied in this area in 1954 for the first time to control boll weevil. In 1955 as many as 20 applications of insecticide were made for boll weevil control. It is thought that a strain of the weevil had become adapted to the arid conditions of north-central Mexico and had spread gradually northward to Texas.

In the fall of 1960, surveys conducted in the Presidio Valley on the Texas-Mexican border showed that the boll weevil had gradually spread northwestward. Light boll weevil infestations were found on a limited acreage in the El Paso Valley. At this same time surveys revealed a second area where the weevil had moved north from west-central Mexico toward the border. Infestations were found in Sonora, Mexico, in the vicinity of Magdalena about 35 miles south of Nogales on the Arizona border.

During the time the weevil was spreading north out of Mexico, there was spread from east to west in this country. In the late 1950's the weevil had extended its range into west Texas and, by 1961, it was found both above and below the Cap Rock on the eastern edge of the Texas High Plains. There was a late damaging infestation on the High Plains in 1962 for the first time. Still, it was thought that it would not become established on the High Plains because of the severe winters. Nevertheless, the heavy populations below the Cap gave reason for grave concern. The gravity of the situation was indicated in the winter of 1963-64 by populations in hibernation below the Cap which were as high as any ever found in the southeast. Research that was initiated in the fall of 1963 revealed that the weevil did overwinter on the High Plains under natural conditions.

Following the establishment of the boll weevil in the Presidio area of Texas, research workers made tests designed to lower overwintering populations by attacking the diapause populations late in the season. The program is based on the fact that boll weevils must reach a state of diapause in order to survive an extended period when cotton is not available for food and breeding sites. It was found that methyl parathion applied at 10- to 12-day intervals in the fall would kill boll weevils before they attain diapause. Field experiments indicated that 2 to 4 applications of insecticide applied immediately before and during the harvest period, followed by the destruction of food and breeding sites by frost, chemicals, and mechanical means, materially reduced and probably eradicated the overwintering population. This was an entirely new concept of boll weevil control which added still another weapon to the arsenal reserved for this pest.

med with this information and aware of the continuing spread of the weevil, the National Cotton Council conceived the idea of enlarging the tests to treat all of the cotton grown on both sides of the Rio Grande River between Ruidosa and El Paso to determine if eradication could be accomplished and to learn the practicability of establishing a weevil-free area. If successful in accomplishing eradication, the program would establish a barrier against further spread to the north and west. The test was made in the fall of 1961 with the Texas A & M University, the National Cotton Council, Texas State Department of Agriculture, the Mexican Defensa Agricola, and the Entomology Research and Plant Pest Control Divisions of the Agricultural Research Service cooperating. There were 3,000 acres of cotton in this area. An aggregate of 8,088 acres on both sides of the Rio Grande in the Big Bend area was treated; 2,454 acres in the United States and 5,634 acres in Mexico. Methyl parathion at the rate of one-half pound per acre, plus water to make a total of three gallons, was applied by aircraft at 10- to 14-day intervals. In addition, 122 acres were treated with ground equipment near El Paso with the insecticide Sevin (carbaryl). This acreage was in a populated area and carbaryl was selected because of the hazard attending use of highly toxic material. The El Paso Cotton Association cooperated in this program. Although a small pocket of weevils was found near El Paso in 1962, there were indications that the plan was sound. The treatment of this area was repeated in the fall of 1962 as an actual barrier plan and the program was extended to the infestation of about 2,500 acres in northern Sonora. Treatments were applied again in the same areas in 1963 and 1964 on about 7,000 acres.

Following the discovery that the boll weevil could overwinter in the High Plains of Texas, the Plains Cotton Growers, Inc., with a membership of about 25,000 representing all segments of the industry, became interested in the diapause treatment as a means of preventing spread and establishment of the boll weevil on the Texas High Plains. To promote the plan they first established an Industry Steering Committee with representation from the 23 counties involved to handle arrangements with the growers. They then enlisted the aid of the Extension Service to conduct an intensive educational program. A technical advisory committee was established of research, regulatory, and industry personnel to formulate a plan. The technical committee decided it was feasible and practicable to establish a 3-year program which would have as its goal the eradication of the boll weevil on the High Plains, and the complete suppression of populations below the Cap Rock to a point where yearly seasonal treatment could keep the weevil in check. It was to be a \$2 million cooperative program with the industry paying one-half the cost. Industry funds were to be raised by an assessment against the grower of \$0.50 a bale at the compress. The Federal Government would be asked to pay the other half.

The industry group adopted the proposed program, and arrangement was made for the Congress to provide \$1 million for the U. S. Department of Agriculture to participate in the program. The Plant Pest Control Division of ARS was asked to operate the program. Scientists with the Texas A & M University and the Entomology Research Division of ARS provided technical assistance, and the Texas State Department of Agriculture assisted with the surveys.

Both the industry and the State and Federal Governments had an important stake in the program. The industry was interested in protecting the highly productive cotton area of the High Plains where 15 percent of the Nation's cotton is grown. The U. S. Department of Agriculture was interested in the program because it would afford immediate protection to the vast cotton acreage on the High Plains; it would minimize the hazard of spread to 25 percent of the Nation's crop grown in Arizona, California, and New Mexico; it would preclude the needs for growers to use large volumes of insecticides for yearly control--pesticides which are coming into more and more disfavor; and, it would buy time for research to find new ways of dealing with the boll weevil problem.

Surveys made during the summer revealed infestation on about 180,000 acres in an area 100 miles by 50 miles in size in nine counties. Initial plans called for three or four applications of methyl parathion on that acreage--the program to terminate with the first killing frost.

At the outset, the Plant Pest Control Division had misgivings about applying the highly toxic methyl parathion on the large acreage. Likewise, we have always disliked any program requiring the application of as much as three gallons of insecticide spray to the acre. Over the years our methods improvement people have felt that low volume treatments were the only sound procedure for large-scale operations. Accordingly, we conceived the low volume idea and used it successfully in the application of straight technical malathion at only eight ounces to the acre for the control of beet leafhopper, cereal leaf beetle, and grasshoppers. Thus, there was reason to believe that the low volume application of technical malathion might be successful for the boll weevil control program.

In order to determine this, a series of tests were established in cooperation with the Entomology Research Division of ARS, and research workers of Texas A & M in the Harlingen, Texas area during the summer of 1964. In these tests malathion at 9- to 18-ounce rate to the acre proved to be as effective or more so than the standard treatment involving methyl parathion and guthion. The tests were then repeated on the High Plains early in the fall with equally good results. Based

on this work the low volume straight technical malathion treatment was selected in place of methyl parathion for the High Plains work. It was applied at 12 and 16 ounces to the acre.

The first treatment was applied on September 16, 1964, with subsequent treatments at 6- to 10-day intervals until a killing frost. As the program progressed, additional acreage was found and included in the program. The ultimate infestation pattern was 290,000 acres and an aggregate of 1,100,000 acres was treated. The treating was done by private operators under contract who also furnished the flagmen. The area was divided into five units with four planes operating out of each. The Plant Pest Control Division transferred experienced personnel into the area to handle supervision and Plant Pest Control pilots handled all technical aspects associated with the contractor's planes and pilots. The entire treatment area was tied together by a ground-to-air and ground-to-ground radio network operating on a special agricultural frequency.

An interesting comparison can be made between the methyl parathion and malathion treatments. If the standard methyl parathion treatment had been used in the High Plains program, 80 aircraft and 150 ground supporting personnel would have been required. With malathion the job was done with 35 ground support personnel and 20 aircraft. Thus, costs were reduced by more than one-half and the volume of spray by 96 percent. With the increase in acreage discovered after the work was started, the job could not have been done with the methyl parathion treatment with the funds and facilities that were available. As it was the work was completed with slightly more than half of the original estimated cost.

The 1964 program was an excellent cooperative effort between research and regulatory personnel and the cotton industry. The objective was accomplished--the boll weevil was eradicated in many fields and effectively suppressed in all others. We anticipate an assist from nature to further reduce the weevil population that went into hibernation.

As I said earlier, the boll weevil is a formidable insect and we know that a very small overwintering population can build up to fabulous numbers under favorable conditions during the growing season. Perhaps we have found a truly vulnerable spot in his armour. Only time will tell if this is a sound and effective way of dealing with the problem.

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